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World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

PCT/US03/03801

P1 1480486

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:
UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

November 30, 2006

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RECORDS OF THE UNITED STATES PATENT AND TRADEMARK
OFFICE ACTING AS A RECEIVING OFFICE UNDER THE PATENT
COOPERATION TREATY.**

APPLICATION NUMBER: PCT/US02/39945

FILING DATE: December 13, 2002

REC'D 05 DEC 2006

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By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office

Andrea T Bennett

ANDREA T BENNETT

Certifying Officer



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PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

PCT/US02/39945

For receiving Office use only

PCT/US 02/39945

International Application No.

13 DEC 02 (13.12.02)

International Filing Date

PCT INTERNATIONAL APPLICATION
RO/US

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 60,469-065

Box No. I TITLE OF INVENTION STEPCHAIN LINK FOR AN ESCALATOR	
Box No. II APPLICANT <input type="checkbox"/> This person is also inventor	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) OTIS ELEVATOR COMPANY Five Farm Springs Road Farmington, Connecticut 06032 US	
Telephone No. (248) 988-8360	
Facsimile No. (248) 988-8363	
Teleprinter No.	
Applicant's registration No. with the Office	
State (that is, country) of nationality: US	State (that is, country) of residence: US
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input checked="" type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) MEYER, Helmut J. W. Plettenbergstrasse 8 31675 Buckeburg Germany	
This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)	
Applicant's registration No. with the Office	
State (that is, country) of nationality: Germany	State (that is, country) of residence: Germany
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<input checked="" type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.	
Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) Karin H. Butchko, Reg. No. 45,864 CARLSON, GASKEY & OLDS, P.C. 400 West Maple Road, Suite 350 Birmingham, Michigan 48009 US	
Telephone No. (248) 988-8360	
Facsimile No. (248) 988-8363	
Teleprinter No.	
Agent's registration No. with the Office 45,864	
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

Sheet No. ...2...

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
<i>If none of the following sub-boxes is used, this sheet should not be included in the request.</i>	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) FARGO, Richard N. 12 Mohawk Road Plainville, CT 06062 United States of America	This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.) Applicant's registration No. with the Office
State (that is, country) of nationality: United States of America	State (that is, country) of residence: United States of America
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) WESSON, John P. 39 Donnell Road Vernon, CT 06066 United States of America	This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.) Applicant's registration No. with the Office
State (that is, country) of nationality: United States of America	State (that is, country) of residence: United States of America
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) MILTON-BENOIT, John M. 68 Spence Street Springfield, MA 01104 United States of America	This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.) Applicant's registration No. with the Office
State (that is, country) of nationality: United States of America	State (that is, country) of residence: United States of America
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) 	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.) Applicant's registration No. with the Office
State (that is, country) of nationality: United States of America	State (that is, country) of residence: United States of America
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<input type="checkbox"/> Further applicants and/or (further) inventors are indicated on another continuation sheet.	

Box No. V DESIGNATION OF STATES

Mark the applicable check-boxes below; at least one must be marked.

The following designations are hereby made under Rule 4.9(a):

Regional Patent

- ☒ **AP ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZM Zambia, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT (if other kind of protection or treatment desired, specify on dotted line)
- ☒ **EA Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP European Patent:** AT Austria, BE Belgium, BG Bulgaria, CH & LI Switzerland and Liechtenstein, CY Cyprus, CZ Czech Republic, DE Germany, DK Denmark, EE Estonia, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, SK Slovakia, TR Turkey, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GQ Equatorial Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> AE United Arab Emirates | <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> AG Antigua and Barbuda | <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> OM Oman |
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> PH Philippines |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> JP Japan | |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> KR Republic of Korea | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> BZ Belize | <input checked="" type="checkbox"/> KZ Kazakhstan | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> LC Saint Lucia | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> CH & LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> LK Sri Lanka | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> LR Liberia | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> CO Colombia | <input checked="" type="checkbox"/> LS Lesotho | <input checked="" type="checkbox"/> TN Tunisia |
| <input checked="" type="checkbox"/> CR Costa Rica | <input checked="" type="checkbox"/> LT Lithuania | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> LU Luxembourg | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> LV Latvia | |
| <input checked="" type="checkbox"/> DE Germany | <input checked="" type="checkbox"/> MA Morocco | <input checked="" type="checkbox"/> TZ United Republic of Tanzania |
| <input checked="" type="checkbox"/> DK Denmark | <input checked="" type="checkbox"/> MD Republic of Moldova | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> DM Dominica | | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> DZ Algeria | <input checked="" type="checkbox"/> MG Madagascar | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> EC Ecuador | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> MN Mongolia | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> MW Malawi | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> MX Mexico | <input checked="" type="checkbox"/> ZA South Africa |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> MZ Mozambique | <input checked="" type="checkbox"/> ZM Zambia |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> NO Norway | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> GE Georgia | | |
| <input checked="" type="checkbox"/> GH Ghana | | |

Check-boxes below reserved for designating States which have become party to the PCT after issuance of this sheet:

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Sheet No. ...4...

Supplemental Box*If the Supplemental Box is not used, this sheet should not be included in the request.*

1. *If, in any of the Boxes, except Boxes Nos. VIII(i) to (v) for which a special continuation box is provided, the space is insufficient to furnish all the information: in such case, write "Continuation of Box No." (indicate the number of the Box) and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:*
 - (i) *if more than two persons are to be indicated as applicants and/or inventors and no "continuation sheet" is available; in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;*
 - (ii) *if, in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;*
 - (iii) *if, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;*
 - (iv) *if, in addition to the agent(s) indicated in Box No. IV, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;*
 - (v) *if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if, in Box No. V, the name of the United States of America is accompanied by an indication "continuation" or "continuation-in-part": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;*
 - (vi) *if, in Box No. VI, there are more than five earlier applications whose priority is claimed: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI.*
2. *If, with regard to the precautionary designation statement contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.*

Continuation of Box IV

Carlson, John E.	Laba, Kerrie A	Cho, Anthony P.
Olds, Theodore W.	Wisz, David L.	Shih, Anna M.
Gaskey, David J.	Butchko, Karin H.	
Gottschalk, William S.	Siragusa, John M.	
Henley, Randy	Snyder, Troxell	
O'Brien, Sean	Osborn, Thomas	

Sheet No. ...5...

Box No. VI PRIORITY CLAIM

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application:* regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				
item (4)				
item (5)				

☐ Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office) identified above as:

☐ all items ☐ item (1) ☐ item (2) ☐ item (3) ☐ item (4) ☐ item (5) ☐ other, see Supplemental Box

* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(b)(ii)):

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA / .. US

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)

Number

Country (or regional Office)

Box No. VIII DECLARATIONS

The following declarations are contained in Boxes Nos. VIII (i) to (v) (mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):

Number of
declarations

- | | | |
|---|--|---|
| <input type="checkbox"/> Box No. VIII (i) | Declaration as to the identity of the inventor | : |
| <input type="checkbox"/> Box No. VIII (ii) | Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent | : |
| <input type="checkbox"/> Box No. VIII (iii) | Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application | : |
| <input type="checkbox"/> Box No. VIII (iv) | Declaration of inventorship (only for the purposes of the designation of the United States of America) | : |
| <input type="checkbox"/> Box No. VIII (v) | Declaration as to non-prejudicial disclosures or exceptions to lack of novelty | : |

Box No. IX CHECK LIST; LANGUAGE OF FILING

This international application contains:

(a) the following number of sheets in paper form:

request (including declaration sheets) : 6
 description (excluding sequence listing part) : 11
 claims : 7
 abstract : 1
 drawings : 10

Sub-total number of sheets : 35

sequence listing part of description (actual number of sheets if filed in paper form, whether or not also filed in computer readable form; see (b) below) :

Total number of sheets : 35

(b) sequence listing part of description filed in computer readable form

(i) ☐ only (under Section 801(a)(i))(ii) ☐ in addition to being filed in paper form (under Section 801(a)(ii))

Type and number of carriers (diskette, CD-ROM, CD-R or other) on which the sequence listing part is contained (additional copies to be indicated under item 9(ii), in right column):

This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):

- | | | |
|---|---|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | : | 1 |
| 2. <input checked="" type="checkbox"/> original separate power of attorney | : | 3 |
| 3. <input type="checkbox"/> original general power of attorney | : | |
| 4. <input checked="" type="checkbox"/> copy of general power of attorney; reference number, if any: | : | 2 |
| 5. <input type="checkbox"/> statement explaining lack of signature | : | |
| 6. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): | : | |
| 7. <input type="checkbox"/> translation of international application into (language): | : | |
| 8. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material | : | |
| 9. <input type="checkbox"/> sequence listing in computer readable form (indicate also type and number of carriers (diskette, CD-ROM, CD-R or other)) | : | |
| (i) <input type="checkbox"/> copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application) | : | |
| (ii) <input type="checkbox"/> (only where check-box (b)(i) or (b)(ii) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter | : | |
| (iii) <input type="checkbox"/> together with relevant statement as to the identity of the copy or copies with the sequence listing part mentioned in left column | : | |
| 10. <input checked="" type="checkbox"/> other (specify): Cert. of Express Mail/Postcard. | : | |

Figure of the drawings which should accompany the abstract:

Language of filing of the international application:

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



Karin H. Butchko - Agent

(13.12.02)

For receiving Office use only

1. Date of actual receipt of the purported international application: DT03 Rec'd PCT/PTO 13 DEC 2002	2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority (if two or more are competent): ISA / US	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

PCT/US02/39945

This sheet is not part of and does not count as a sheet of the international application.

PCT**FEE CALCULATION SHEET**
Annex to the Request

For receiving Office use only

International Application No. **PCT/US 02/39945**

13.12.02

Date stamp of the receiving Office

Applicant's or agent's
file reference

60,469-061

Applicant

OTIS ELEVATOR COMPANY**CALCULATION OF PRESCRIBED FEES**

1. TRANSMITTAL FEE

240.00 **T**

240

2. SEARCH FEE

700.00 **S**

700

International search to be carried out by ISA/US
(If two or more International Searching Authorities are competent to carry out the international search, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

Where item (b) of Box No. IX applies, enter Sub-total number of sheets

Where item (b) of Box No. IX does not apply, enter Total number of sheets

b1 first 30 sheets 407.00 **b1**

407

b2 x = **b2**
number of sheets in excess of 30 fee per sheet

45

b3 additional component (only if sequence listing part of description is filed in computer readable form under Section 801(a)(i), or both in that form and on paper, under Section 801(a)(ii)):400 x = **b3**
fee per sheet

0

Add amounts entered at b1, b2 and b3 and enter total at B 407.00 **B**

452

Designation Fees

The international application contains 93 designations.5 x 88 = 440.00 **D**
number of designation fees payable (maximum 5) amount of designation fee

440

Add amounts entered at B and D and enter total at I 847.00 **I**

892

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

P

0

4. FEE FOR PRIORITY DOCUMENT (if applicable)

1,787.00

1832

5. TOTAL FEES PAYABLE

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

TOTAL

☐ The designation fees are not paid at this time.**MODE OF PAYMENT**☒ authorization to charge
deposit account (see below)☐ postal money order☐ cash☐ coupons☐ cheque☐ bank draft☐ revenue stamps☐ other (specify):**AUTHORIZATION TO CHARGE (OR CREDIT) DEPOSIT ACCOUNT**
(This mode of payment may not be available at all receiving Offices)☒ Authorization to charge the total fees indicated above.☒ (This check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.☐ Authorization to charge the fee for priority document.Receiving Office: RO/ USDeposit Account No.: 15-0750Date: 13 December 2002Name: Karin H. Butchko - 45864Signature: Karin Butchko

PCT

PCT/US02/39945

GENERAL POWER OF ATTORNEY

(for several international applications filed under the Patent Cooperation Treaty)

(PCT Rule 90.5)

The undersigned person(s):

(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

OTIS ELEVATOR COMPANY
Five Farm Springs Road
Farmington, Connecticut 06032

US

hereby appoints (appoint) the following person as:



agent



common representative

Name and address

(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

CARLSON, GASKEY & OLDS, P.C.

400 West Maple Road
Suite 350
Birmingham, MI 48081
US

Carlson, John E.
Gaskey, David J.
Olds, Theodore W.
Gottschalk, William S.
Laba, Kerrie A.

Wisz, David L.
Butchko, Karin H.
Cho, Anthony P.
Siragusa, John M.

to represent the undersigned before



all the competent International Authorities



the International Searching Authority only



the International Preliminary Examining Authority only

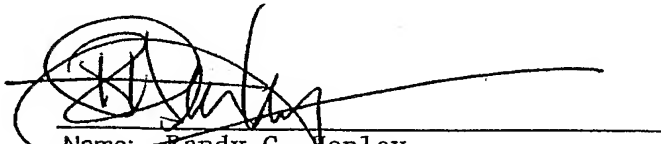
in connection with any and all international applications filed by the undersigned with the following Office

RO/US

as receiving Office

and to make or receive payments on behalf of the undersigned.

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April 16, 2002

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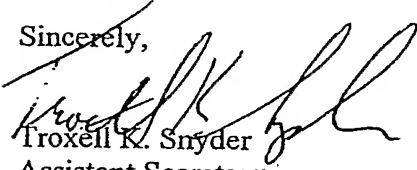
Re: International Applications Under
Patent Cooperation Treaty

Sir:

Persons signing as Intellectual Property Counsel or Deputy Intellectual Property Counsel have the authority to act as attorneys or agents on behalf of the Otis Elevator Company in connection with any and all Patent Cooperation Treaty International Applications wherein Otis Elevator Company is named as Applicant. This authority includes the power to appoint additional attorneys and/or agents to represent Otis Elevator Company as an Applicant before the competent International Authorities.

This authority shall remain in effect until you are notified of revocation.

Sincerely,


Troxell K. Snyder
Assistant Secretary
Otis Elevator Company

PCT

PCT/US02/39943

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(PCT Rule 90.4)

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- ☒ all the competent International Authorities
☐ the International Searching Authority only
☐ the International Preliminary Examining Authority only

in connection with the international application identified below:

Title of the invention: STEPCHAIN LINK FOR AN ESCALATOR

Applicant's or agent's file reference: 60469-065

International application number (if already available):

filed with the following Office United States Patent and Trademark Office (RO/US) as receiving Office
and to make or receive payments on behalf of the undersigned.

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Date: 25/10/2002

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STEPCHAIN LINK FOR AN ESCALATOR

BACKGROUND OF THE INVENTION

5 This invention generally relates to passenger conveyor systems. More particularly, this invention relates to a stepchain link for a passenger conveyor which has a plurality of teeth that are made of an integrated single piece of material.

Conventional passenger conveyors, such as escalators or moving walkways, include a chain of steps that travel in a loop to provide a continuous movement along
10 a specified path. The steps are connected to a continuous loop of stepchain links that include a plurality of teeth that interact with a drive mechanism. As the stepchain links move, the steps move as desired.

In prior modular-drive passenger conveyor systems, the stepchain links each are made of a plurality of laminated stacked steel sheets each including holes. When
15 the plurality of laminated steel sheets are stacked, the holes are aligned and receive a rivet, securing the laminated, stacked steel sheets together to form a stepchain link.

A drawback to the conventional laminated, stacked steel sheet stepchain links is that the stepchain links are heavy. The prior art stepchain links commonly have a width of 30 mm, which is less than desirable for some applications.

20 The prior art drive chains are made of steel plates and sheets and connected by pin. The stepchain links that cooperate with the drive chain are made of a toothed or cogged laminated stacked steel sheets. As both the stepchain links and the drive chains are steel, lubrication is required. Lubrication also is required at the connection between each of the stepchain links. One drawback to providing lubrication is that
25 lubrication is messy. Another drawback is the need for increased maintenance to replenish the lubrication, for example, and the cleaning of old lubricant.

Hence, there is a need in the art for an arrangement that does not suffer from the weight and lubrication drawbacks and shortcomings of the prior art. This invention includes a stepchain link which has a plurality of teeth that are made of an
30 integrated single piece of material, which does not require lubrication and avoids the other mentioned problems associated with prior designs.

SUMMARY OF THE INVENTION

In general terms this invention is a passenger conveyor system that includes a plurality of stepchain links having a unique configuration that facilitates interaction
5 between the chain and a drive mechanism. The inventive links include a plurality of teeth that are made of an integrated single piece of material.

In one example, the stepchain links are made of die cast metal. When attached, each stepchain link includes a first end that is received between two spaced apart portions in a second end of another stepchain link. The first end and the second
10 end of the stepchain links have holes that are aligned when assembled. An attachment mechanism is inserted in the aligned holes to secure the stepchain links together. In one example, each stepchain link includes a bridge support to support a bridge positioned between the disc members of adjacent steps.

A second example stepchain link is made of steel. The steel can be stamped
15 steel or laser cut steel. Each stepchain link includes two inner portions having a plurality of inner holes. The ends of the inner portions are secured to the ends of another two inner portions by an attachment mechanism. The two inner portions of each link are positioned in an outer portion including a first side, a second side, and a bottom having a plurality of teeth. The first side and the second side have a plurality
20 of outer holes that align with the inner holes of the two inner portions. An attachment member extends through the aligned holes to secure the two inner portions to the outer portion. In one example, the attachment members have a square cross section and are interference fit into correspondingly shaped attachment holes. The two inner portions bear the tensile load of the chain, and the outer portion engages the drive member.

25 In another example embodiment, a plate of injection molded plastic teeth are snapped onto the bottom edge of the two secured inner portions. The plastic teeth engage the drive member.

These and other features of the present invention will be best understood from the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 schematically illustrates selected portions of a passenger conveyor system;

Figure 2 schematically illustrates selected portions of an example drive assembly designed according to the present invention;

Figure 3 schematically illustrates a step of the passenger conveyor system;

Figure 4 schematically illustrates an axle and two example stepchain links ;

Figure 5 schematically illustrates, in perspective view, a first example stepchain link;

Figure 6 schematically illustrates, in perspective view, two first example stepchain links attached;

Figure 7 schematically illustrates a top view of the area encircled 7 in Figure 6;

Figures 8A schematically illustrates a perspective view of the assembly of the inner portions of two of a second example stepchain links;

Figures 8B schematically illustrates a perspective view of the attachment of the inner portions of two of a second example stepchain links;

Figures 8C schematically illustrates a perspective view of the attachment of the outer portion to the second example stepchain links;

Figures 8D schematically illustrates a perspective view of the attachment of the bridge to the two second example stepchain links;

Figure 8E schematically illustrates a perspective view of the second example stepchain links after rotation of the pins and the axle;

Figure 9 schematically illustrates an example outer portion of the second example stepchain link;

Figure 10 schematically illustrates a cross-sectional view taken along the line 10-10 in Figure 8D;

Figure 11 schematically illustrates an end of the outer portion of the second example and an attachment member;

Figure 12A schematically illustrates a top view of an example attachment member;

Figure 12B schematically illustrates an end view of the example attachment member of Figure 12A taken along line 12B-12B;

Figure 13 schematically illustrates another example outer portion of a link including injection molded teeth; and

5 Figure 14 schematically illustrates a rear view of the bridge supported by the stepchain links of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 schematically illustrates a passenger conveyor system 20. This example shows an escalator, but this invention is not so limited. Other conveyors are within the scope of this invention, such as moving walkways. This passenger conveyor system 20 includes steps 24 configured to travel in a loop and having a tread surface 26 and a rise surface 28. A drive assembly 28 moves the plurality of steps 24 in a desired direction. The opposing ends of each step 24 include a disc member 46. 10 A bridge 49 is positioned between the disc members 46 of adjacent steps 24 to close the gap between the disc members 46.

As shown in Figure 2, the drive assembly 28 includes a plurality of stepchain links 30 which form a continuous loop. The stepchain links 30 have a plurality of teeth 32 that engage an outer surface 34 of a drive member 36. Preferably, the outer surface 34 of the drive member 36 has a profile that corresponds to the profile of the plurality of teeth 32. In one example, each tooth 32 has a height of 5 mm and a pitch of 20 mm. 20

The drive member 36 in one example preferably has a width X of 65 mm wide and the stepchain links 30 preferably have a width Y of 70 mm (shown in Figure 10). 25 The drive member 36 in one example is a belt that is formed of polyurethane and includes a plurality of cords. In this example, the plurality of cords made of steel or Kevlar and are the tensile carrying portion of the drive member 36. The drive member 36 is formed by placing the cords in a two piece mold. Polyurethane is introduced into the mold, integrating the plurality of cords within the polyurethane. In such an arrangement, as the drive member 36 is polyurethane, lubrication is not needed 30

between the stepchain links 30 and the drive member 36 as there is no metal-to-metal engagement. In another example, the drive member 36 is a drive chain.

A drive sheave 38 engages an inner surface 40 and the plurality of cords of the drive member 36 to move the drive member 36 around a loop. An idle sheave 42 is positioned at an opposite end of the loop from the drive sheave 38. A drive mechanism 44 is schematically shown for moving the drive sheave 38 in the desired direction and at the desired speed. The drive mechanism 44 includes a motor and a braking mechanism as known in the art, for example. Preferably, the passenger conveyor system 20 includes two drive members 36 running in parallel at the lateral edges of the steps 24 and two sets of continuous stepchain links 30. Each set of continuous stepchain links 30 cooperates with one of the drive members 36.

Teeth 32 on the stepchain links 30 engage the outer surface 34 of the drive member 36 so that the steps 24 move responsive to the drive mechanism 44. Various tooth 32 profiles may be used, depending on the particular arrangement. In the present invention, the teeth 32 are made of an integrated single piece of material.

As shown in Figure 3, each step 24 includes a disc member 46 adjacent each side edge of the step 24. The disc members 46 prevent objects from getting caught along the edges of the passenger conveyor system 20 during operation and moves with the steps 24.

As shown in Figure 4, the ends 58 and 60 of the axle 52 are attached to a corresponding stepchain link 30. The cap 186 is attached by the hub portion 50 of the disc members 46 such that the stepchain links 30 are positioned outwardly of the disc members 46.

Figure 5 illustrates a first example stepchain link 130 made of die cast metal, such as aluminum or magnesium. The stepchain link 130 includes a plurality of teeth 132, a first end 168 having a hole 170, and a second end 172 with two spaced portions 174 and 175 each having a hole 176 and 178, respectively. The axle 52 is press-fit into a hole 182 in the stepchain link 130.

Each stepchain link 130 further includes a bridge support 180 which supports the bridge 49 positioned between the disc members 46 of adjacent steps 24 during operation of the conveyor system 20 (further shown in Figure 1). The bridge 49, as

further shown in Figure 14, is preferably made of aluminum. The bridge 49 is substantially v-shaped and includes an enlarged upper end 55 and a smaller lower end 57. Sides 59 extend from the upper end 55 to the lower end 57. Each bridge 49 includes a pin 51 on the lower end 57 which is received in the bridge support 180, securing the bridge 49 to the stepchain link 130.

The link 130 further includes a webbed portion 173 which carries the tensile forces when the plurality of stepchain links 130 are in tension. The webbed portion 173 prevents bending and transfers tensile forces from the spaced portions 174 and 175 to the first end 168.

Figure 6 illustrates an example pair of stepchain links 130a and 130b. The first end 168b of the stepchain link 130b is inserted between the two spaced apart portions 174a and 175a of stepchain link 120a. As shown in Figure 7, the holes 170b, 176a and 178a are aligned and receive an attachment member 184, securing the stepchain links 130a and 130b together. A cap 186 and a stepchain roller 188 are attached to the opposing ends of the attachment member 184. The shouldered attachment member 184 secures the stepchain links 130a and 130b and is press fit in the hole 170b, fixing the distance between the wheel 64 and the cap 186.

As further shown in Figure 7, needle bearings 190 are positioned between the attachment member 184 and the holes 176a and 178a, eliminating the need for lubrication. The needle bearings 190 rotate around the attachment member 184. The lubrication is sealed in the bearings 190 during assembly, eliminating the need to lubricate the bearing 190 during use. Although only two stepchain links 130a and 130b are illustrated and described, it is to be understood that a plurality of stepchain links 130 are employed to create a continuous loop.

Although the stepchain links 130a and 130b have been described as having a first end 168 and a second end 172 with two spaced portions 174 and 175, it is to be understood that stepchain links 130a can include two first ends 168a and stepchain links 130b can include two second ends 172b having two spaced apart portions 174b and 175b. The stepchain links 130a and 130b are assembled in an alternating pattern to create a continuous loop.

In another example, the stepchain links 230 are made of sheet metal portions, as shown in Figures 8A to 10. In one example, steel is the preferred material. The steel can be stamped or laser cut. Figures 8A to 8D show two links 230a and 230b at various stages of assembly.

5 Each stepchain link 230a and 230b in this example includes two inner portions 262. The inner portions 262 of the stepchain link 230b are spaced close together. The inner portions 262 of the stepchain link 230a are spaced farther apart and are outside of the inner portions 262 of the stepchain link 230b. Each inner portion has a first hole 264 near one end a second hole 266 at an opposite end. The inner portions 262
10 include a plurality of inner teeth 268 and a plurality of attachment holes 270. Although Figure 8A illustrates four attachment holes 270 on each inner portion 262, it is to be understood that any number of attachment holes 270 can be employed.

The inner portions 262 are assembled in an alternating manner such that both the first holes 264 and the second holes 266 of a first stepchain link 230a are located
15 outwardly of the first holes 264 and second holes 266 of the adjacent stepchain links 230b. That is, the second holes 266 of the inner portions 262 of a first stepchain link 230a are positioned outwardly of the first holes 264 of the inner portions 262 of a second stepchain links 230b. The second holes 266 of the inner portions 262 of the second stepchain link 230b are positioned inwardly of the first holes 264 of a third
20 stepchain link (not shown). The second holes 266 of the inner portions 262 of the third stepchain link (not shown) are positioned outwardly of the first holes 264 of a fourth stepchain link (not shown), and so on.

As shown in Figure 8B, an attachment member 284 is inserted in the aligned holes 264 of one link and 266 of an adjacent link to secure the inner portions of the
25 links together. The holes 266 are larger than the holes 264, and needle bearings (not shown) are press fit in the holes 266, eliminating the need for lubrication. The attachment member 284 is press fit in the holes 264 of the stepchain links 230b and in the needle bearings in the holes 266 of the stepchain links 230b. The needle bearings rotate around the attachment member 284. A cap 286 and a stepchain roller 288 are
30 attached to the opposing ends of the attachment mechanism 284 after the attachment member 284 is inserted.

As shown in Figures 8C through 10, an outer portion 272 is attached to the inner portions of each link. In this example, each outer portion 272 is made up of two pieces, although more or fewer pieces could be used. The outer portion 272 includes a first side 274 and a second side 276 that are on opposite sides of the corresponding inner portion. A bottom surface 278 includes a plurality of teeth 232 having a profile that cooperates with the outer surface 34 of the drive member 36.

When assembled, as shown in Figures 8D and 10, the plurality of inner teeth 268 of the inner portions are nestingly received into grooves 271 on an inner side of the bottom surface 287. The outer portions 272 provide an engagement surface for the drive member 36 independently without bearing the tensile loads on the link. The inner portions bear the tensile load.

The inventive arrangement allows for a wide stepchain link 130, 230 and belt 36 interface (shown in Figure 10) without having an undesirably high link weight. Preferably, the interface between the stepchain links 130, 230 and the belt 36 is 40 mm to 100 mm. Most preferably, the interface is 65 mm. There is also a substantially constant teeth 132 width and pitch across the span between adjacent teeth 132. The inner portions are advantageously heavier gauge steel in one example compared to the outer portions. The inner portions are strong enough to bear the tensile loads while the outer portions 272 provide more surface area for better engagement with the drive member 32. But the outer portions 272 need not carry the tensile loads.

Returning to Figures 8C and 8D, the sides 274 and 276 of each outer portion 272 include a plurality of attachment holes 290 that align with the attachment holes 270 of the corresponding inner portions. An attachment member 282 is inserted into the aligned holes 270 and 290 to secure the outer portion 272 to the inner portions. When assembled, the outer portion 272 of one stepchain link 230 does not contact the outer portion 272 of adjacent stepchain link 230. As shown in Figure 8E, the attachment members 282 are inserted in the aligned attachment holes 270 and 290 and rotated up to 45° to create an interference fit.

Figure 11 illustrates one of the attachment holes 290. In the illustrated example, each attachment hole 270 and 290 is generally square shaped and at least a portion of the attachment members 282 have a corresponding cross-section. In the

illustrated example, the attachment members 282 are inserted in the aligned attachment holes 270 and 290 and rotated up to 45° to create an interference fit. It is to be understood that other shapes of the attachment holes 270 and 290 and attachment members 282 are possible.

5 Returning to Figure 8D, an attachment member 282 having an axle 252 is inserted into the aligned holes 270 and 290 closest to the stepchain rollers 288. In one example, the aligned holes 270 and 290 also have a generally square cross-section and the attachment member 282 having the axle 252 has a corresponding cross section. The axle 252 is inserted into the aligned attachment holes 270 and 290 and rotated up
10 to 45° to create an interference fit, securing the axle 252 to the stepchain links 230.

Figure 12A illustrates a top view of an attachment member 282. Figure 10 shows the attachment member 282 inserted into the aligned holes 270 and 290 of a stepchain link 230. Each attachment member 282 includes a plurality of flanges 292 that are spaced to receive the link portions between them. In one example, the each
15 flanges 292 extend continually around the outer surface of the attachment member 282. The flanges 292 are positioned on opposite sides of grooves 293 between the flanges 292.

Figures 12B illustrates an end view of the attachment member 282 of Figure 12A. As shown, the corners of the grooves 293 are more rounded than the corners of
20 the flanges 292. The attachment members 282 preferably are inserted such that the grooves 293a align with the holes 290 of the outer portion 272, the grooves 293b align with the holes 270 of the outwardly inner portions 262 of the stepchain links 230a, and the grooves 293c align with the holes 270 of the inwardly inner portions 262 of the stepchain links 230b.

25 When all the parts are properly aligned, the attachment member 282 can be rotated about its axis. The holes 270 and 290 and the outside geometry of the grooves 293 preferably cooperate to provide an interference fit when the attachment member 282 is rotated. The flanges 292 are configured to fit through the holes 270 and 290 during insertion and then to abut corresponding surfaces of the link portions once
30 rotated. The flanges 292 engage the inner portions 262 and the sides 274 and 276 of

the outer portion 272 and maintain the desired lateral spacing between the link portions.

As seen in Figure 8D, a bridge support 280 attached to the inner portion provides a support for the bridge 49 during operation of the conveyor system 20 similar to the bridge support 180 of Figure 4. The bridge support 280 is preferably attached to an inner portion by welding, pins, or the like.

Another example link configuration is shown in Figure 13. An injection molded plate 292 having teeth 294 is snapped on the inner portions 262 and secured by an attachment member 296. The attachment member 296 can be a screw, pin, or another known fastener. The plate 292 provides a non-metallic drive member engagement surface on the links. By employing the plate 292 of injection molded teeth 294, corrosion is reduced.

Although multiple inner portions are used with each link in the illustrated example, one inner portion may be used. Similarly, more than two inner portions may be provided for each link.

The stepchain links 130 and 230 of the present invention carry the loads of the steps 24 and transfer the load from the drive member 36 to the plurality of stepchain links 130 and 230 through the plurality of teeth 132 and 232. Therefore, the stepchain links 130 and 230 carry the load of the passenger conveyor system 20.

The outer portions are may take a variety of forms, depending on the selected method of securing the inner an outer portions together. Those skilled in the art who have the benefit of this description will be able to select the best component design to met their particular needs.

There are several benefits to the stepchain links of the present invention. The teeth 32 are made of a single integrated piece of material. As the width of the stepchain links is greater than the prior art, there is greater surface area contact and better interaction between the stepchain links and the drive member. The polyurethane belt and the bearings reduce the need for lubrication. The stepchain links of the present invention prevent twisting under the eccentric load and prevent buckling while under compression. Additionally, the diecast stepchain links are light in weight and low in cost. As the die cast part is formed of one piece, there is no

assembly tolerance stack up as there is with the prior art stacked laminated sheets and the number of parts are reduced. The material of the sheet stepchain links is insensitive to defects, and there are no thermal expansion issues between the attachment members and the stepchain links.

5 The foregoing description is only exemplary of the principles of the invention. Many modifications and variations are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than using the example embodiments which have been specifically described. For that reason the following claims should be studied to
10 determine the true scope and content of this invention.

CLAIMS

We claim:

1. A drive assembly for a passenger conveyor system comprising:
a drive member; and
5 a plurality of metal stepchain links each having a plurality of teeth made of an integrated piece of material that engages a corresponding surface on said drive member.
2. The assembly as recited in claim 1 wherein each of said plurality of teeth of
10 said plurality of stepchain links have a substantially constant teeth width which is substantially constant across a span between adjacent teeth.
3. The assembly as recited in claim 1 wherein said plurality of teeth of said plurality of stepchain links continually engage said drive member.
- 15 4. The assembly as recited in claim 1 wherein said plurality of teeth of said plurality of stepchain links have a substantially constant pitch which is substantially constant across a span between adjacent teeth.
- 20 5. The assembly as recited in claim 1 wherein said drive member comprises a non-metallic portion and a metallic portion.
6. The assembly as recited in claim 1 wherein each said stepchain link comprises a single piece of die cast metal.
- 25 7. The assembly as recited in claim 6 wherein said die cast metal is selected from the group consisting of aluminum and magnesium.

8. The assembly as recited in claim 7 wherein each of said stepchain links includes a first end having a hole and a second end having two spaced apart portions, each including a hole, said first end of one of said stepchain links is received at least partially between said second end portions of another of said plurality of stepchain links, and including an attachment member received through said holes to secure said first end of said one stepchain links to said second end of said another stepchain link.

9. The assembly as recited in claim 7 wherein a first of said stepchain links includes a first end having a first hole and a second end having a second hole and a second of said stepchain links includes a third end having two spaced apart portions each including a third spaced apart hole and a fourth end having two spaced apart portions each including a fourth spaced apart hole, and each of said first end and said second end of said first of said stepchain links is received at least partially between one of said third end having two spaced apart portions and said fourth end having two spaced apart portions, and including an attachment member received through said holes to secure said first end and said second end of said one stepchain links to one of said third end and said fourth end of said another stepchain links.

10. The assembly as recited in claim 1 wherein each said stepchain link comprises at least one piece of sheet metal.

11. The assembly as recited in claim 10 wherein said stepchain links each include an outer drive member engaging portion having a first side and a second side and a bottom extending therebetween, said bottom having at least some of said plurality of teeth, and said sheet metal piece is secured to said outer portion such that said sheet metal piece carries tensile loads on said links.

12. The assembly as recited in claim 11 wherein a distance between said at least one piece of sheet metal is smaller than a width of said bottom of said stepchain links.

13. The assembly as recited in claim 11 wherein each stepchain link includes at least two sheet metal pieces secured to said outer portion, said sheet metal pieces of one of said stepchain links secured to said sheet metal pieces of an adjacent stepchain link, said outer portions of adjacent links not contacting each other.

5

14. The assembly as recited in claim 11 wherein said sheet metal piece include lateral openings and said first and said second sides of said outer portion include corresponding openings and including an attachment member received through said openings to secure said outer portion to said sheet metal pieces.

10

15. The assembly as recited in claim 11 wherein a plate having a plurality of plastic teeth are secured on said bottom having some of said plurality of teeth.

15

16. The assembly as recited in claim 1 wherein an interface between said drive member and said plurality of metal stepchain links is between 40 mm and 100 mm.

17. The assembly as recited in claim 16 wherein an interface between said drive member and said plurality of metal stepchain links is 65 mm.

20

18. A passenger conveyor system comprising:

a plurality of steps moveable in a loop along a path;

at least one panel member adjacent each step;

a drive member; and

5 a plurality of metal stepchain links each having a plurality of teeth made of an integrated piece of material that engages a corresponding surface on said drive member.

10 19. The system as recited in claim 18 wherein each of said plurality of teeth of said plurality of stepchain links have a substantially constant teeth width which is substantially constant across a span between adjacent teeth.

20. The system as recited in claim 18 wherein said plurality of teeth of said plurality of stepchain links continually engage said drive member.

15 21. The system as recited in claim 18 wherein said plurality of teeth of said plurality of stepchain links have a substantially constant pitch which is substantially constant across a span between adjacent teeth.

20 22. The system as recited in claim 21 wherein said drive member comprises a non-metallic portion and a metallic portion.

25 23. The system as recited in claim 21 wherein each of said plurality of stepchain links includes a support that at least partially supports a bridge positioned between said at least one panel members of adjacent steps.

24. The system as recited in claim 18 wherein said stepchain links are formed of die cast metal.

30 25. The system as recited in claim 24 wherein said die cast metal is selected from the group consisting of aluminum and magnesium.

26. The system as recited in claim 18 wherein each said stepchain link comprises at least one piece of sheet metal.

5 27. The system as recited in claim 26 wherein said stepchain links each includes an outer drive member engaging portion having a first side and a second side and a bottom extending therebetween, said bottom having at least some of said plurality of teeth, and said sheet metal piece is secured to said outer portion such that said sheet metal piece carries tensile loads on said links.

10 28. The system as recited in claim 26 wherein a distance between said at least one piece of sheet metal is smaller than a width of said bottom of said stepchain links.

15 29. The system as recited in claim 26 wherein each stepchain link includes at least two sheet metal pieces secured to said outer portion, said sheet metal pieces of one of said stepchain links secured to said sheet metal pieces of an adjacent stepchain link, said outer portions of adjacent links not contacting each other.

20 30. The system as recited in claim 26 wherein a plate having a plurality of plastic teeth are secured on said bottom having some of said plurality of teeth.

31. The system as recited in claim 18 wherein an interface between said drive member and said plurality of metal stepchain links is between 40 mm and 100 mm.

25 32. The system as recited in claim 31 wherein an interface between said drive member and said plurality of metal stepchain links is 65 mm.

33. A stepchain link for a passenger conveyor system comprising:
a body portion of a single piece of metal each; and
a plurality of teeth made of an integrated piece of material that engage
a corresponding surface on a drive member.

34. A stepchain link for a passenger conveyor system comprising:
- a first portion adapted to carry tensile loads on the link; and
 - a second portion adapted to engage a drive member, said second portion not carrying said tensile loads.

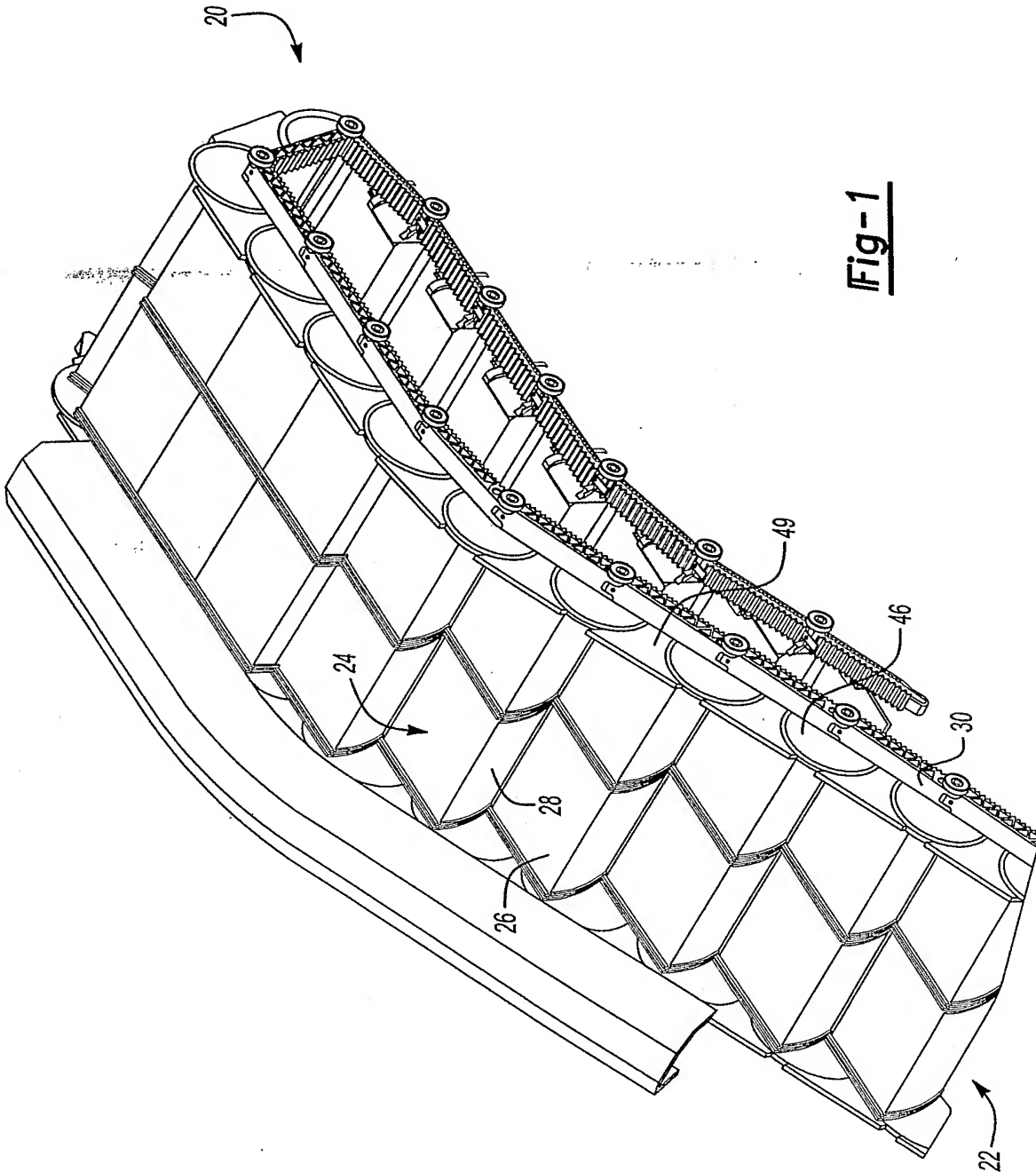
ABSTRACT OF THE DISCLOSURE

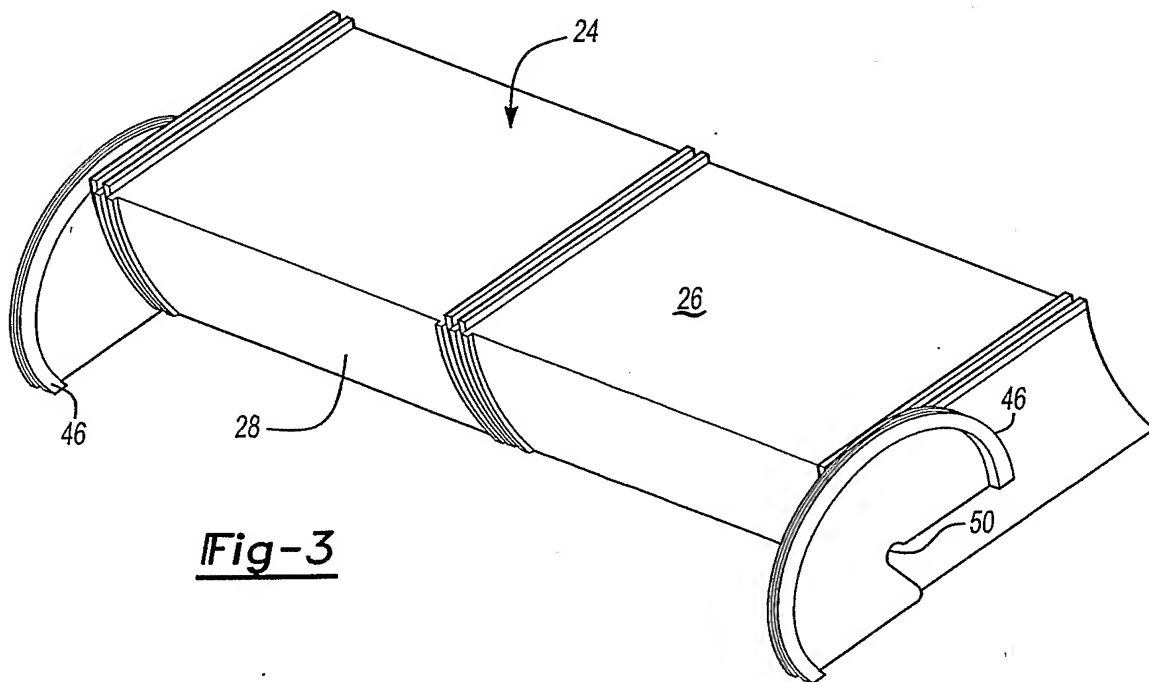
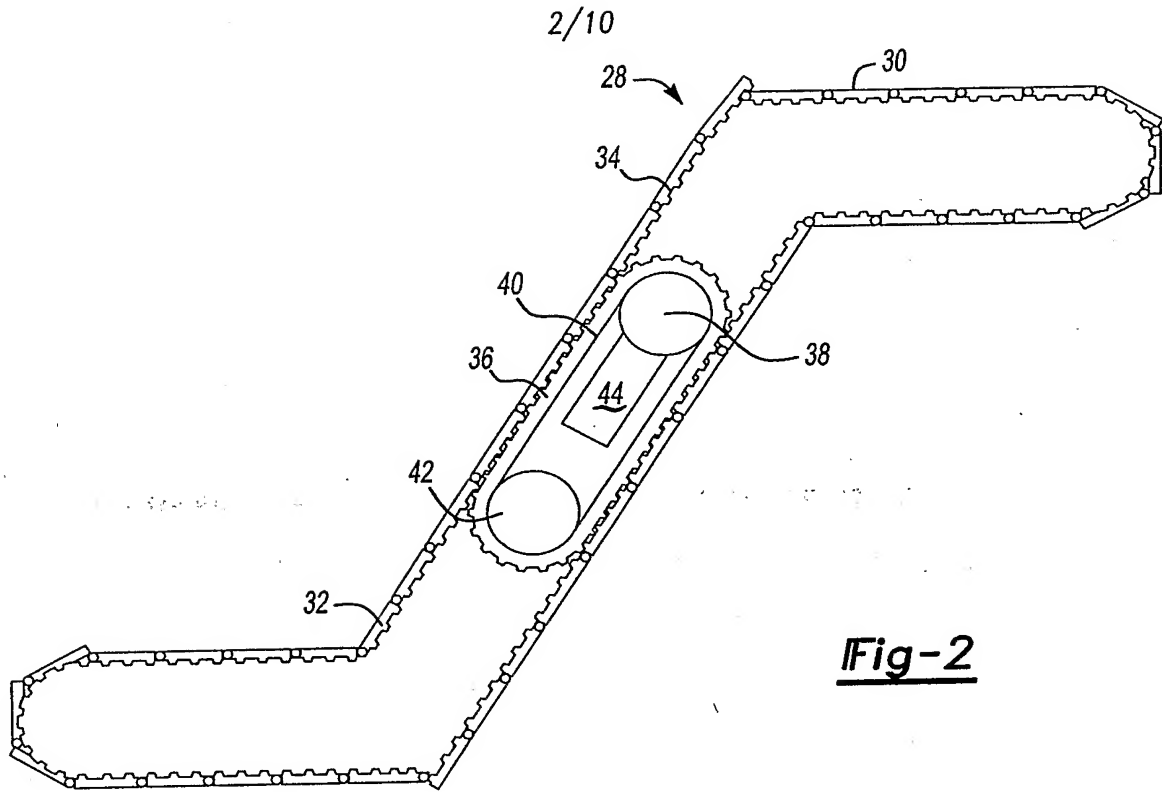
A plurality of stepchain links (30, 130, 230) of a passenger conveyor system (20) connected to form a continuous loop are formed from die cast metal or from stamped or laser cut metal. Each stepchain link (30, 130, 230) includes a plurality of
5 teeth (32, 132, 232) made of a single piece of material that engage a drive member (36). In one example, a plate of injection molded plastic teeth (294) are snapped onto the links to reduce corrosion.

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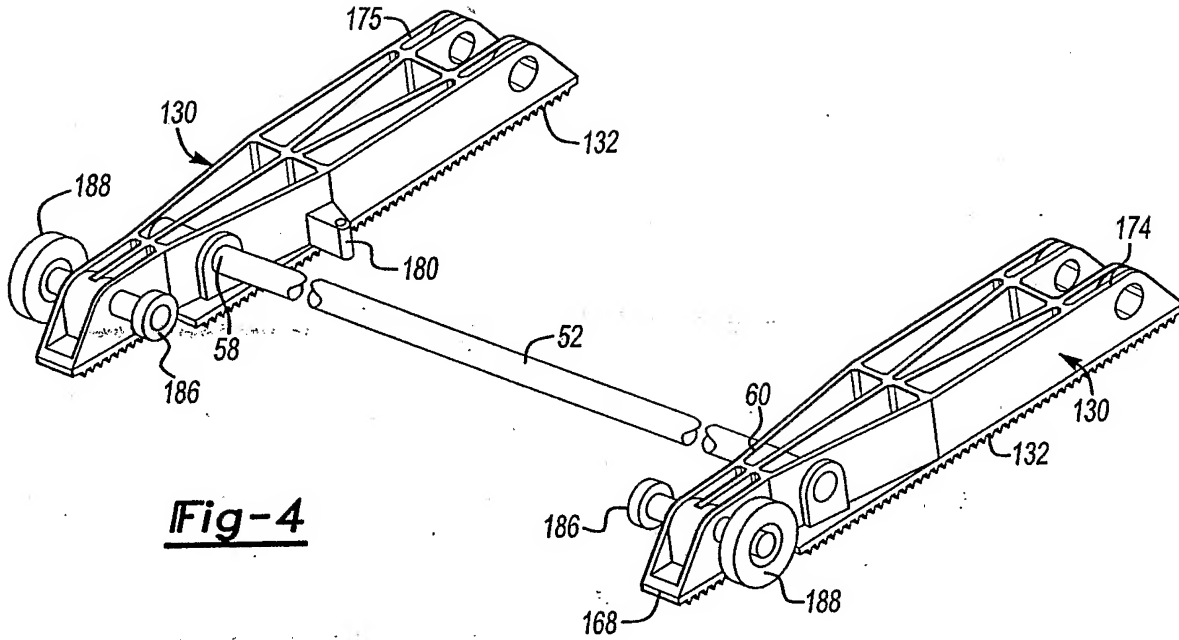


Fig-4

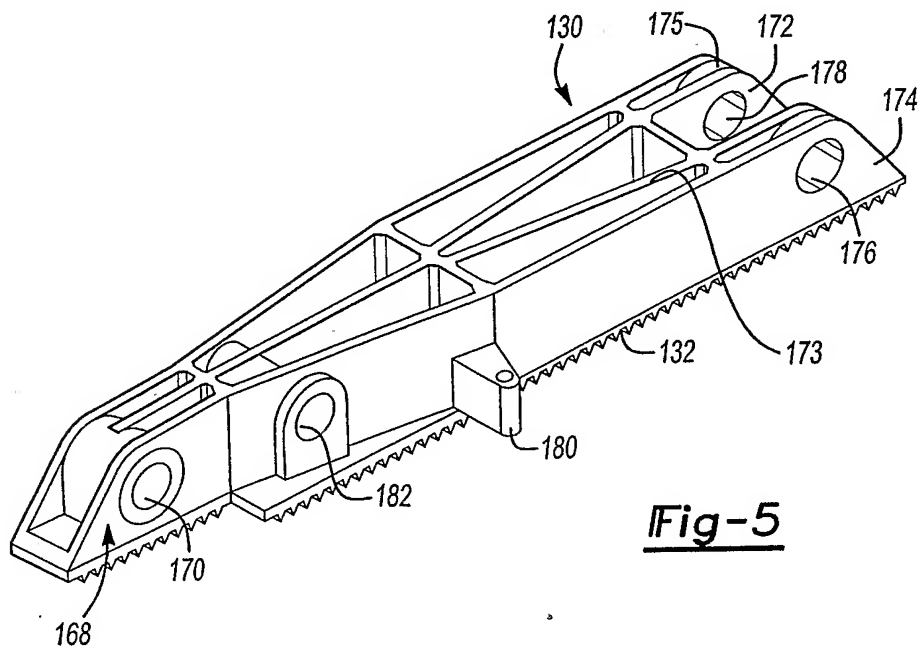


Fig-5

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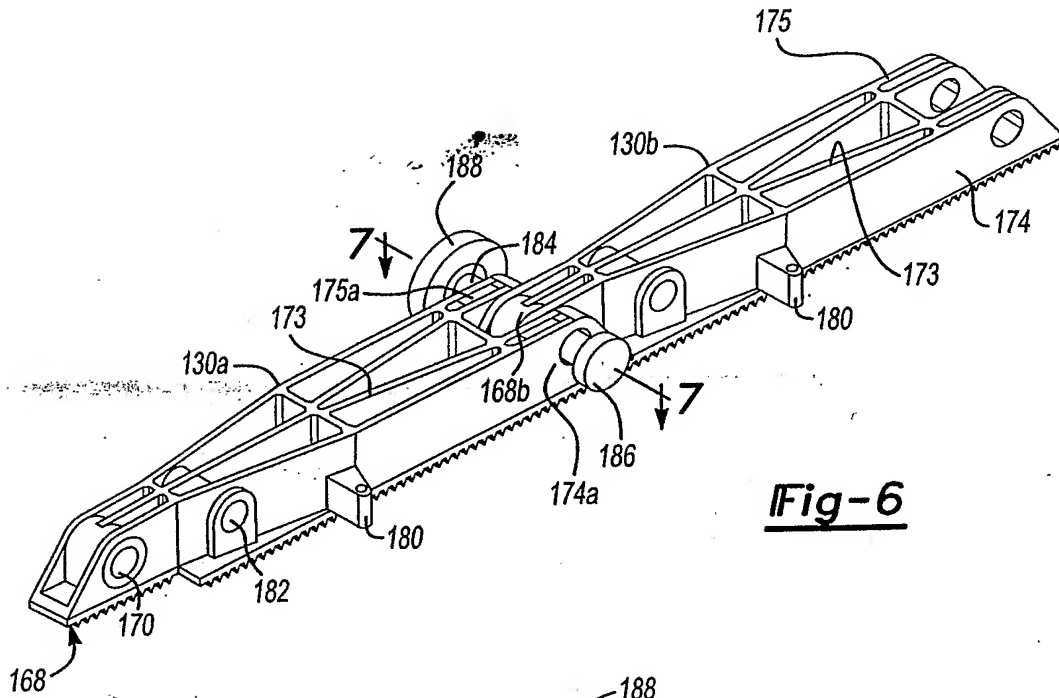


Fig-6

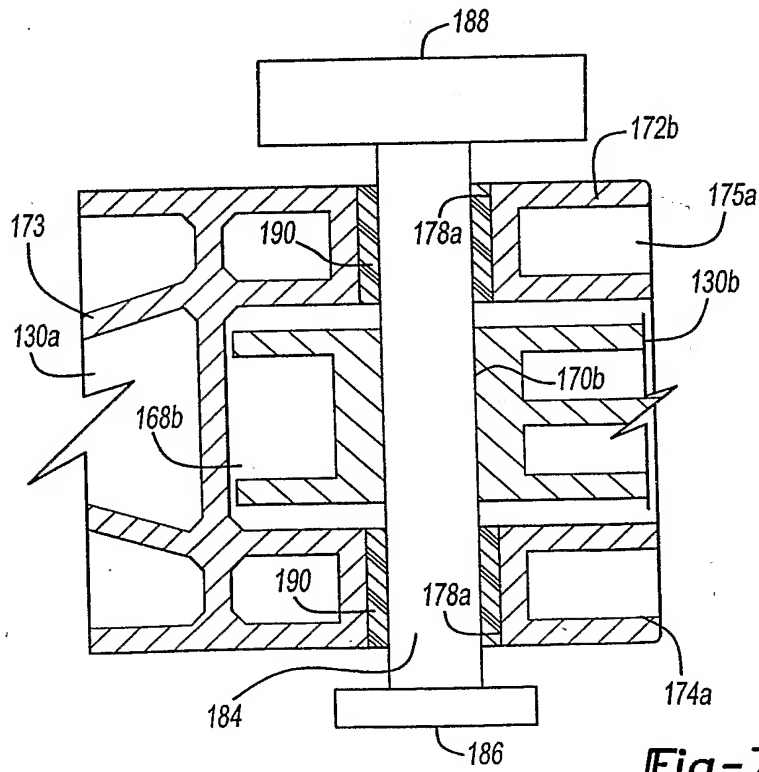


Fig-7

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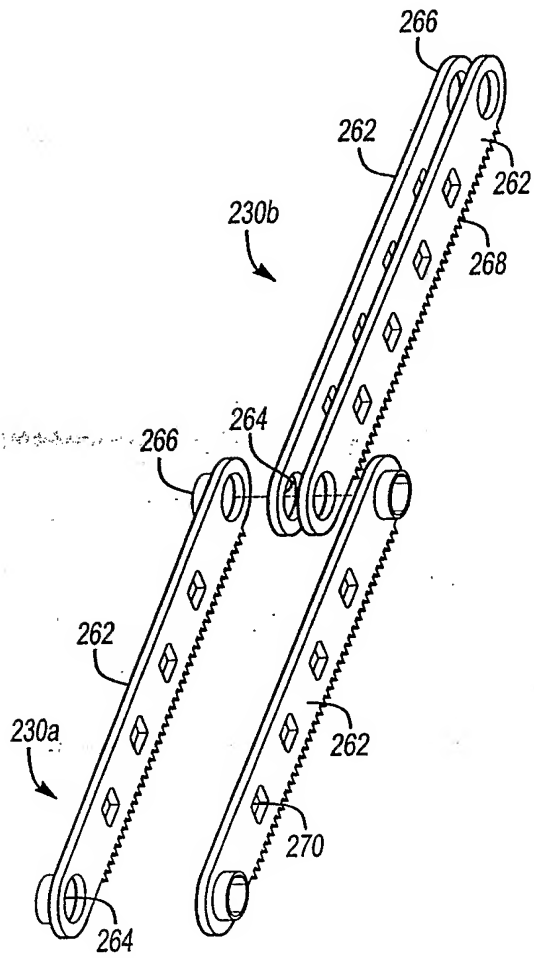


Fig-8A

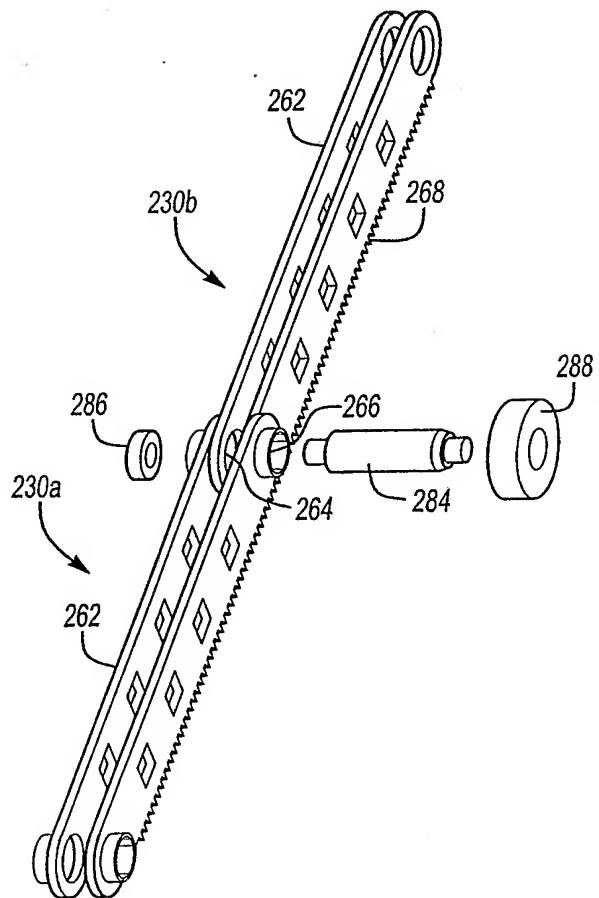


Fig-8B

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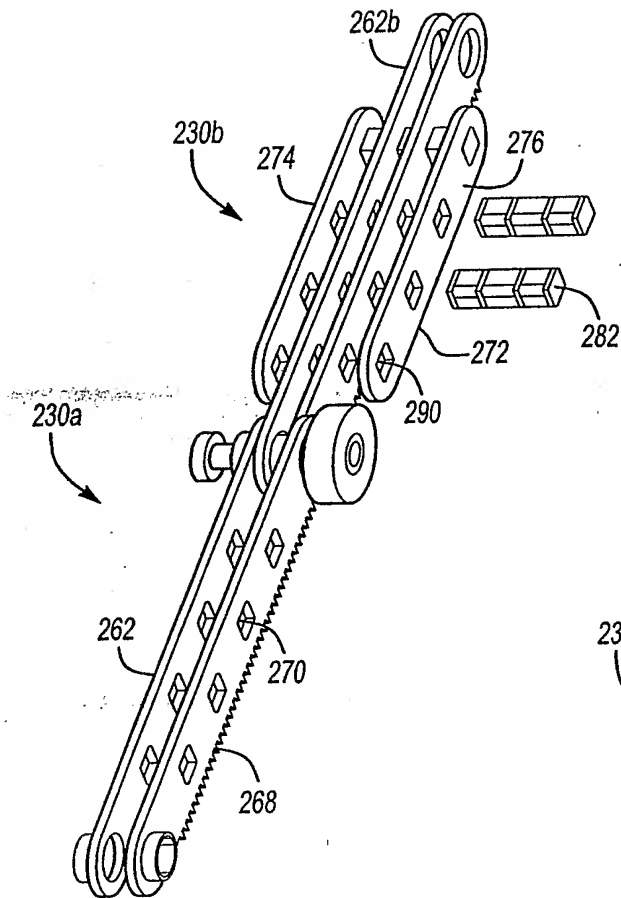
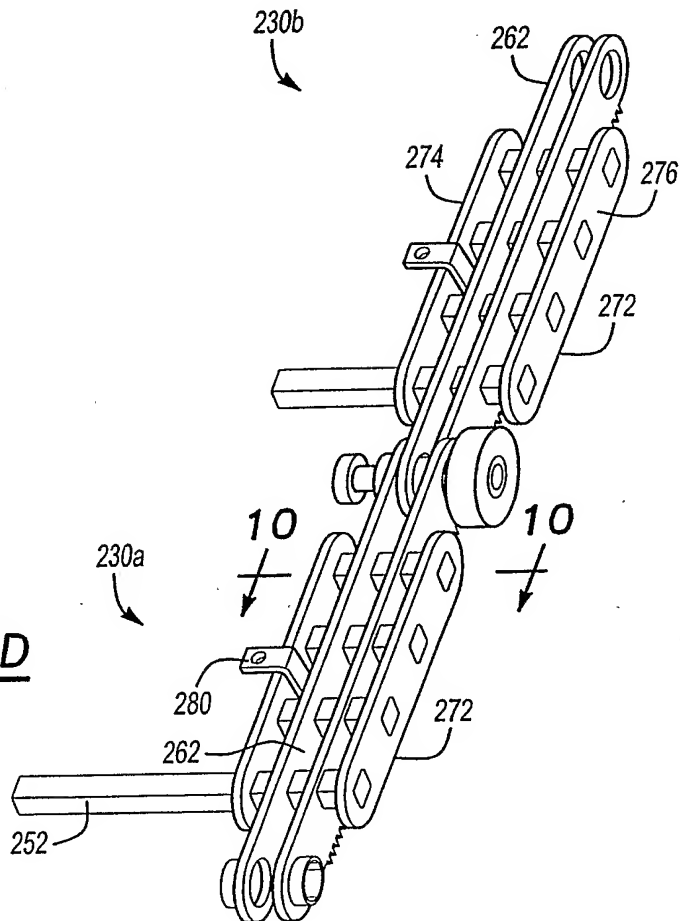


Fig-8C

Fig-8D



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Fig-8E

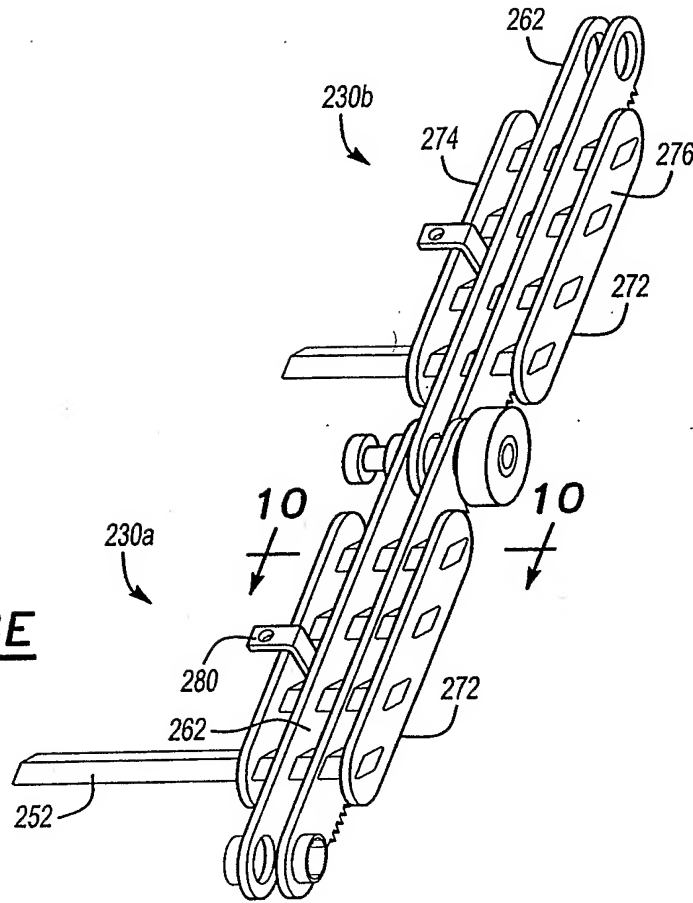
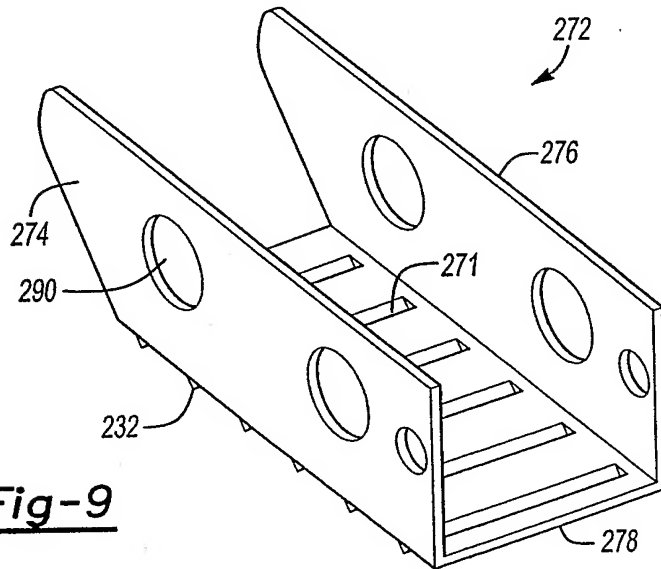


Fig-9



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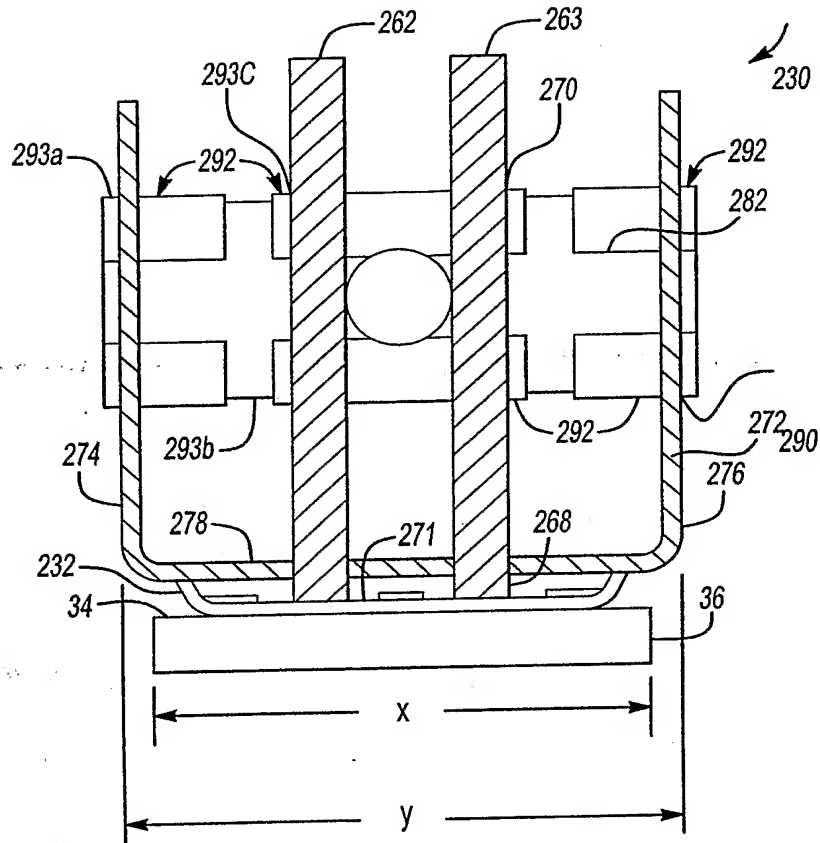


Fig-10

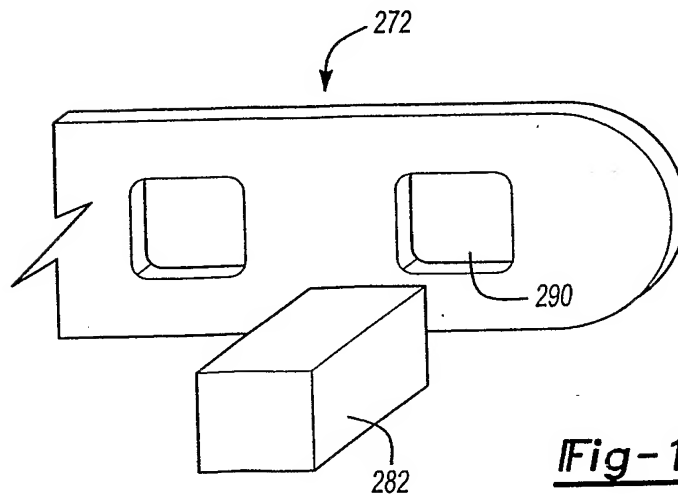


Fig-11

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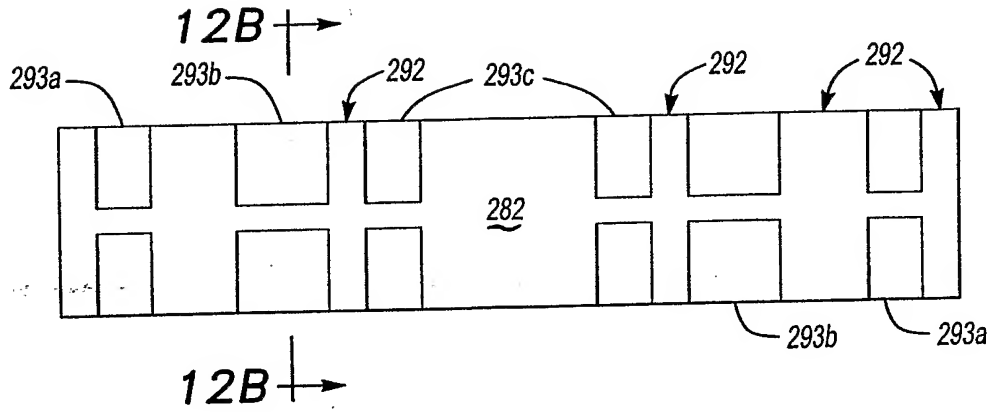


Fig-12A

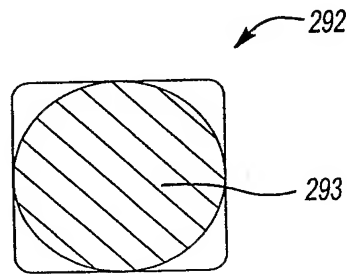


Fig-12B

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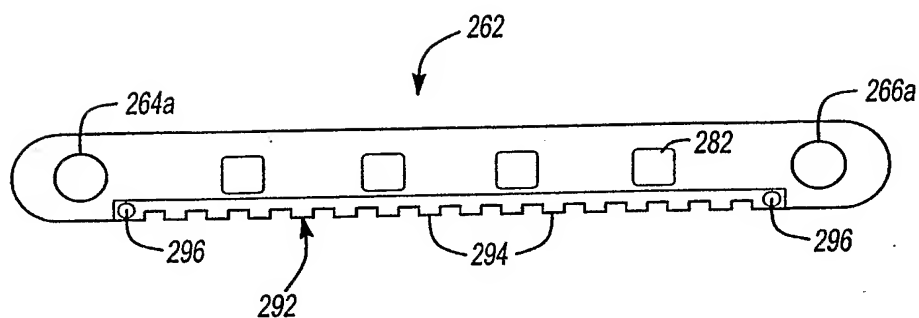


Fig-13

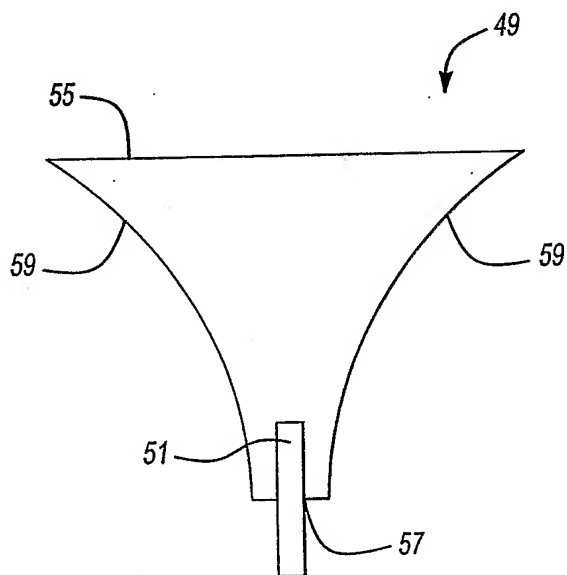


Fig-14